Book Reviews

Battlespace Technologies: Network-Enabled Information Dominance

R. S. Deakin

The format of this book is the first thing that impressed me. The page layout has a highlighted margin that is used effectively to pull out key points within certain sections and the book contains numerous diagrams, figures and stunning photographs. However, I do feel that some of the photographs have possibly been used for artistic impression rather than direct relevance to the subject.

The introduction of the book seemed to jump straight into detail and was a little hard-going, however the rest of the book was easy to read and provided good high level non-technical explanations of the subject matter. The book is aimed at and would be useful for anyone who is new to the subject of Network Enabled Capability (NEC) and Information Dominance as it is written in easy to understand terminology but provides a large number of references for those wanting to look further into the subject.

The book covers a large number of differing but related subject areas demonstrating the complexities involved in Information Warfare and NEC and this is particularly highlighted in Chapter 4 which provides long lists of different communications system and datalinks which could be used to provide vital information in the war fighting environment.

When read cover to cover the book is a little bit repetitive but this means that the sections stand alone and enables the reader to dip into chapters for reference rather than having to read the whole book. The appendices are a good source of reference material even though they still remain at a high level.

In conclusion, this book is an excellent introduction for the unfamiliar reader, the information is well-presented, easy to understand and provides sufficient references for those wishing to delve deeper into the subject area.

Dr Peter J. Crozier CEng, MIET

Theoretical and Computational Aeroelasticity

W. P. Rodden

Aeroelasticity is the science that considers the interaction of aerodynamic, inertial and structural forces and has a major effect upon the design and performance of aircraft and other flexible structures where there are interactions between aerodynamic flows and the structure.

Bill Rodden has been an important figure in the world of aeroelasticity for well over 40 years, being known particularly for the development of the ‘Doublet-Lattice’ method which has been the workhorse of flutter and gust response computations in the aerospace industry worldwide since the 1970s. This book has been eagerly awaited for many years by the aeroelastic community, with bulletins on its
progress being delivered by the author to the regular meetings of the Aerospace Flutter and Dynamics Council (the ‘Flutter Club’) in the USA.

The Preface states that the book may be considered as an autobiography and, indeed, covers many of the technical areas and developments in the field that Dr Rodden has been involved with over the years, primarily dealing with fixed-wing aircraft. The book is aimed at advanced students and practising engineers, including chapters on A Brief History of Aeroelasticity, Steady and Unsteady Aerodynamics, Structural Deflections, Vibrations, Quasi-static Aeroelasticity, Flutter, Transient Response – Landing and Gust Loads, Random Response – Atmospheric Turbulence and Runway Roughness, Aeroservoelasticity, Aerothermoelasticity and finally Aeroelastic Design: Optimisation (written by Erwin Johnson and Garret Vandeplaats.)

There is a great amount of detail, taking the reader through the classical theoretical developments that have led to the coupled aerostructural-control models widely used today. Perhaps the title is likely to confuse some readers as ‘Computational Aeroelasticity’ is used here to refer to the numerical analysis required for aeroelasticians, rather than the more usual definition of coupled CFD/FE modelling. There is only a brief overview of CFD methods and the treatment of FE is related only to simple elements and systems. Regular reference is made to some of the mathematical models that can be found originally in the classic book by Bisplinghoff, Ashley and Halfman.

The wait for Theoretical and Computational Aeroelasticity has been worthwhile. The book is going to be of particular interest to the practising aeroelastician who will gain a great deal from the numerous insights and historical notes that thread the whole book together.

**Designing Unmanned Aircraft Systems: a Comprehensive Approach**

**J. Gundlach**


The subtitle of this book, *A Comprehensive Approach*, proves to be entirely appropriate. Almost every facet of current Unmanned Aircraft System (UAS) design and potential future design is covered from familiar aircraft design topics such as aerofoil selection and engine sizing through to perhaps less well known topics such as theoretical NIIRS (National Imagery Interpretability Rating Scale) prediction and the calculation of personnel numbers to support a UAS deployment.

The book begins with an overview of UAS including the motivations and challenges for UAS development and an interesting take on the history of UAS development based around the rearmament cycles of various nations. The author humorously acknowledges that it is ‘unlikely that people would flock to theatres if the movie *Top Gun* was about UCAVs’ – perhaps the lack of appeal of these systems to aviators is why there is still a bias towards manned aircraft in defence procurement?

The first half of the book covers the more traditional aspects of aircraft design from initial sizing, geometry and configuration, aerodynamics, weight estimation, structures, propulsion systems and flight performance. The author craftily provides just enough depth on each subject to give the reader an understanding of all the contributing factors and providing references from where to get more detailed information. Equations are introduced in a logical and easy to follow manner together with informed narrative into how the nuances of
UAS specific requirements will impact upon the design. This book will certainly be handy for many an undergraduate UAS design project. Relevant worked examples and problems are provided for the readers self-learning. Of note, the author provides a useful derivation for the calculation of endurance and range of battery powered aircraft, something which has remained elusive in many aircraft design texts.

The second half of the book covers subjects that are more specific to UAS. Launch and recovery, communication systems, remote sensing, mission systems (and importantly, how to integrate them), command and control (‘Acquisition officials seldom if ever display desk models of ground control station shelters’), reliability, maintenance, supportability and transportability. Again sufficient depth is provided across this broad spectrum, notably an in depth guide to link budgets and an excellent introduction to reliability calculations.

The book then details how all these various design implications come together through multi-disciplinary design and optimisation techniques to yield a system that has both utility and survivability. The book also provides a useful guide to estimating the cost incurred through research, development, manufacture, testing and operation of UAS. The author ends with a slightly dark overview of product definition and requirements development noting that ‘unmanned systems are advancing so rapidly that traditional procurement cycles are often out of step’, a comment that may sound all too familiar to some.

The true value of this book stems from its comprehensive nature. The range of material covered within a convenient single volume will appeal to single discipline design engineers requiring knowledge of other design areas through to procurement specialists requiring an overview of all the technological considerations for UAS acquisition. Whilst UAS may be considered to be rather complex systems, this book shows that each design aspect is based upon well established engineering knowledge and so combining these technologies together should not be something to fear, rather we should all be embracing what is becoming a ‘Golden Era’ for UAS.

Jonathan Pulham, MEng, AMRAeS

Engineering Dynamics: a Comprehensive Introduction

M. J. Kasdin and D. A. Paley

The book, as the name implies, is a ‘Comprehensive Introduction’ to engineering dynamics and is targeted at (American) undergraduates in all branches of the subject. The authors have designed the book to progressively expand the subject by re-introducing the maths of first year mechanics and add the ‘sophistication’ of vector calculus and differential equations.

I like this book. The approach is to expand the reader’s understanding and confidence yet maintaining the rigour in notation while making the material approachable. It is the way that the authors make the subject understandable that places this book above its peers as a student primer. The authors fear that they may be seen as pedantic, but they are not – they give confidence. They develop the subject though providing copious but simple examples and by revisiting them later in the book to expand the topics in vector theory or differential equations. Through repeated problem solving you discover that you have been painlessly led into an understanding of the maths without realising it.

I must be understood that this book is not targeted at aerospace students. Some simple space based examples are used in the early pages (such as the dynamics of a female astronaut ‘dropping’ her tool bag in space!). Aerodynamicists have to wait for pages 426-
431 for an introduction to Euler angles and pages 560-568 for equations of motion of an aeroplane.

The book starts with revision of Newton mechanics with revision of calculus and vectors etc. put into appendices. Part 1 covers particle dynamics. Part 2 extends to multi-particle dynamics. Part 3 covers 2-dimensional relative motion which is extended to 3D in Part 4. Finally Part 5 introduces ‘advanced topics’ such as flight dynamics. But as the authors say this is just a taster for the interested student.

Each chapter teaches through examples and then concludes with tutorial examples that the authors suggest should be selected by the instructor for his students. No answers are provided, but an instructor’s manual is available through the publisher’s web site. Problem solving through MATLAB is included in the text.

In conclusion this is a very good introductory primer to engineering dynamics before aerospace engineers specialise in their chosen topic. Having read this they would be able to better understand a textbook on flight dynamics, even one that is not the best at explaining the subject.

_Eur Ing, Mike Stanberry, MRAeS_

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**Integrated Microwave Front-Ends: with Avionics Applications**

**L. G. Maloratsky**


_T_his book gives an in-depth insight into microwave front-ends and how these are applied in numerous avionic systems. Detailed coverage includes circuit integration, front-end structures and system integration. The book is supported by nearly 200 illustrations and more than 160 equations. The author has the professional experience and qualifications required to be able to describe, analyse and then publish the subject material.

The book considers circuit integration, component miniaturisation and three-dimensional design. System level integration is described for numerous microwave applications including: distance measuring equipment (DME), microwave landing systems (MLS), radio altimeters, global navigation satellite systems (GNSS), air traffic control (ATC) transponders, traffic collision avoidance systems (TCAS) and weather radar. Although the reviewer has more experience with avionic integration, installation and certification at the system level, the book’s coverage of front-end micro-electronics was still of interest. The book addresses system applications for large aircraft; some coverage of general aviation would have been useful. For example, pages 12 and 216 address the subject of ATC transponders, making reference to the system requiring two antennas. This arrangement, i.e. using diversity antennas is only required for aircraft with true airspeeds greater than 250kts or maximum takeoff weight greater than 5,750kg. Aircraft below these speed/MTOW criteria can have single antennas.

The author combines and integrates numerous other publications in this book. Each chapter makes reference to a large number of supporting literature; for example chapter three has 80 specific literature references. Throughout the book, these references cover many subjects ranging from integrated circuits through industry performance standards.

The overall copy-editing, structure and layout of the book is very good and all to a high standard. The book should be an essential resource for any aerospace library, specialist RF/microwave engineers and students of advance electronics.

_David Wyatt, CEng, MRAeS_